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Submission template

TITLE OF CASE <i>Do not include "a case report"</i>
Modified Valsalva Manoeuvre to treat recurrent supraventricular tachycardia: Description of the technique and its successful use in a patient with a previous near fatal complication of DC cardioversion
SUMMARY <i>Up to 150 words summarising the case presentation and outcome (this will be freely available online)</i>
Patients with attacks of re-entrant supraventricular tachycardia (SVT) frequently present to the emergency department (ED). The Valsalva manoeuvre (VM) is the most effective and safe vagal manoeuvre and advocated as first line treatment in stable patients but has a relatively low cardioversion success rate. Improving its efficacy would reduce patients' exposure to the side effects and complications of second line treatments and has other potential benefits. We describe a modification to the VM which is currently being studied and the case of a 23 year old patient who was successfully treated with this modified VM after a previous near fatal complication of DC Cardioversion.
BACKGROUND <i>Why you think this case is important – why did you write it up?</i>
<p>This is the first description we can find of this particular modification to the Valsalva Manoeuvre (VM) and how it was successfully used in a patient whose re-entrant supraventricular tachycardia (SVT) was thought to be refractory to such vagal techniques. It suggests that employing a more effective VM might reduce the number of patients who go on to require unpleasant, more invasive and potentially dangerous treatments. It also specifically describes the modification technique that is currently undergoing national portfolio randomised controlled trial evaluation.</p>
CASE PRESENTATION <i>Presenting features, medical/social/family history</i>
<p>A 23 year old male presented to the ED with SVT. His heart rate was 106, blood pressure 120/55 and he was alert but uncomfortable and complaining of palpitations. He weighed 140Kg and was un-starved.</p> <p>The patient was well known to the hospital with recurrent SVT, of slow rate, with attacks requiring hospital attendance on more than 30 occasions over 13 years. Previously, standard vagal manoeuvres had always been unsuccessful and intravenous adenosine avoided due to intolerable side effects and previous ineffectiveness. Intravenous verapamil had also been unsuccessful. Intravenous flecanide had occasionally worked but his SVT continued to recur despite regular oral flecanide and bisoprolol.</p> <p>He had undergone appropriate specialist investigation and review previously but had declined (with capacity) several offers of radio-frequency ablation therapy prior to this attendance. Latterly, the most effective emergency treatment had been DC cardioversion. He had undergone this on 12 previous attendances and there was an agreed multispecialty plan for its use.</p> <p>At his previous attendance, once more a failed standard Valsalva manoeuvre (VM) had been followed by attempted DC cardioversion. However, during the procedure, the synchronisation mode of the defibrillator had either malfunctioned or been inadvertently re-set. The consequent delivery of an unsynchronised shock resulted in ventricular fibrillation. 12 minutes of advanced life support and 4 attempts at defibrillation was required before return of spontaneous circulation. He subsequently spent 24 hours in intensive care and 3 days in hospital before being discharged neurologically intact.</p>

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INVESTIGATIONS <i>If relevant</i>
His initial ECG, showed a re-entrant SVT, typical of previous attacks and like these had an unusually slow rate which was thought to be due to his bisoprolol and flecanide therapy. Copies of his pre- (figure 1) and post- (figure 2) cardioversion ECG are shown.
DIFFERENTIAL DIAGNOSIS <i>If relevant</i>
TREATMENT <i>If relevant</i>
<p>Given this previous complication, un-starved state and understandable anxiety about DC cardioversion, it was decided to attempt a VM using a modification for which a research proposal was being developed locally:</p> <p><i>Modified Valsalva Manoeuvre Technique:</i> This requires the patient to perform a standardised Valsalva strain (to 40mmHg, verified on a manometer) in a semi-recumbent position for 15 seconds before being laid flat and their legs passively lifted to 45 degrees by staff immediately at the end of the strain to maximise venous return in the relaxation phase for a further 15 seconds.</p> <p>This was immediately successful with return of sinus rhythm during the leg lift and the patient was discharged with advice as how to perform this modified VM himself using a 10ml syringe (shown to equate to 40mmHg pressure when blown to just effect plunger movement[1]) with passive leg lift by a family member.</p>
OUTCOME AND FOLLOW-UP
This modified VM has been added to the patient's management plan. Over the 2 years since he was first successfully treated, the patient has only attended ED 4 further times with an SVT. He has been successfully treated with the modified VM on three of these occasions (the other being with iv flecanide without prior use of any VM). He reports he has successfully used this manoeuvre on numerous occasions at home as advised, negating the need to attend ED.
DISCUSSION <i>Include a very brief review of similar published cases</i>
<p>Vagal manoeuvres such as the VM are recommended first line emergency treatments for SVT but often lack efficacy. Evidence for the optimum VM technique is limited[2] though electrophysiology laboratory studies suggest a strain of 40mmHg for 15 seconds leads to the greatest reflex bradycardia in healthy volunteers[3].</p> <p>Modifications to the VM have been described[4,5,6] and may affect its efficacy in the ED setting[7]. Venous return is increased due to the effects of gravity on blood in the lower limb veins and it is hypothesised that a passive leg lift during phase 3 of the Valsalva, performed immediately at the end of the strain period (phase 1&2), may lead to an exaggerated</p>

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overshoot in blood pressure in phase 4. This may result in greater vagal stimulation to effect bradycardia and increase the chance of cardioversion. A passive leg lift is used as straining to actively lift legs may increase sympathetic tone during phase 3 and therefore be counterproductive.

There is some evidence that a passive leg lift performed during a supine Valsalva leads to greater vagal tone in normal volunteers compared to a sitting or semi-recumbent Valsalva[8]. Although, in this study greater vagal tone was achieved with a plain supine Valsalva, the effect of passive leg lift and supine positioning at the end of a semi-recumbent strain phase (1&2), as used in our case, is unknown. A Valsalva strain performed semi-recumbent may initially exaggerate reduced venous return and hence increase sympathetic stimulation during phase 1&2 which is suddenly reversed with the drop in intrathoracic pressure and increased venous return afforded by the supine position and passive leg lift in phase 3 used in the modified manoeuvre we describe.

This is the first report we can find of the particular manoeuvre used in our patient to treat SVT and has not been previously studied in normal volunteers or patients. Our region is currently conducting a randomised trial of this modification compared to a standard VM in patients presenting to the ED with SVT[9],[10].

Second line treatments for SVT are efficacious but not without side effects and, as our case graphically illustrated, potentially serious, albeit rare complications. Although intravenous adenosine is highly effective, safe and favoured by ED physicians[11], many patients find it very unpleasant and frightening[12]. A more successful VM will reduce the need for patients to go onto receive these treatments and to have a more effective home treatment, saving them and ED staff time.

We have described a case where the use of a modified VM successfully converted a patient's SVT which had been thought to be refractory to vagal manoeuvres. They had previously suffered a severe complication of second line treatment which may have been avoided with use of this simple physical treatment which is currently being further evaluated in a controlled trial.

LEARNING POINTS/TAKE HOME MESSAGES *3 to 5 bullet points – this is a required field*

- Vagal manoeuvres remain the first line treatment for patients presenting with stable SVT
- The Valsalva Manoeuvre (VM) is the safest most effective vagal technique but is often ineffective in standard practice
- Other treatments for SVT are not entirely without risk or discomfort
- A postural modification to the VM might improve its efficacy and prevent the need for further emergency treatment
- The modified VM technique described in this case report is now undergoing randomised controlled trial evaluation

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<p>REFERENCES <i>Vancouver style (Was the patient involved in a clinical trial? Please reference related articles)</i></p> <ol style="list-style-type: none"> 1. Smith G, Boyle M. The 10ml syringe is useful in generating the recommended standard of 40mmHg intrathoracic pressure for the Valsalva manoeuvre. Emerg Med Aust 2009;21:449-454 2. Smith GD, Dyson K, Taylor D, et al. Effectiveness of the Valsalva Manoeuvre for reversion of supraventricular tachycardia. Cochrane Database of Systematic Reviews 2013, Issue 3. Art. No.: CD009502. DOI: 10.1002/14651858.CD009502.pub2. 3. Looga R. The Valsalva manoeuvre – cardiovascular effects and performance technique: a critical review. Respir Physiol Neurobiol 2005; 147: 39-49 4. Chance JF, Warner JG, Elsayy T. Augmented Valsalva maneuver for supraventricular tachycardia in the young. Ann Intern Med 1992; 116: 523 5. Torren A. Modified Valsalva manoeuvre for paroxysmal supraventricular tachycardia [Letter]. Cardiovasc Drugs Ther 1997; 11: 91 6. Mitchell ARJ. Augmented Valsalva manoeuvre in the management of supraventricular tachycardia. Br J Cardiol 1998; 5: 651-652 7. Walker S, Cutting P. Impact of a modified Valsalva manoeuvre in the termination of paroxysmal supraventricular tachycardia. Emerg Med J 2010;27:287-291 8. Wong LF, Taylor DM, Bailey M. Vagal response varies with Valsalva maneuver technique: A repeated-measures clinical trial in healthy subjects. Ann Emerg Med 2004;43(4):477-482 9. The REVERT Trial: Current Controlled Trials (ISRCTN67937027). 10. Appelboam A, Reuben AD, Mann C. Randomised Evaluation of modified Valsalva Effectiveness in Re-entrant Tachycardias (REVERT) study. BMJ Open 2014;4:e004525 doi:10.1136/bmjopen-2013-004525 11. Innes JA. Review article: Adenosine use in the emergency department. Emerg Med Australas 2008; 20(3): 209-215 12. Patient testimonies: http://www.heartrhythmcharity.org.uk/www/218/0/Patient_stories/
<p>FIGURE/VIDEO CAPTIONS <i>figures should NOT be embedded in this document</i></p> <p>Figure 1. Pre-Valsalva ECG showing slow rate SVT</p> <p>Figure 2. Post-Modified Valsalva ECG confirming sinus rhythm</p>
<p>PATIENT'S PERSPECTIVE <i>Optional but encouraged</i></p>

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